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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/668,969	09/24/2003	Akira Ishikawa	740756-2653	1477

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NIXON PEABODY, LLP  
401 9TH STREET, NW  
SUITE 900  
WASHINGTON, DC 20004-2128

EXAMINER
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LE, THAO P

ART UNIT	PAPER NUMBER
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2818

DATE MAILED: 04/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

4A

<b>Office Action Summary</b>	<b>Application No.</b> 10/668,969	<b>Applicant(s)</b> ISHIKAWA, AKIRA	
	<b>Examiner</b> Thao P. Le	<b>Art Unit</b> 2818	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02/02/05.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 3,4 and 9-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 3-4, 9-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>3 pages</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. Claims 3-4, 9-27 are pending.

#### ***Information Disclosure Statement***

2. Information Disclosure Statement (IDS) filed on 02/02/05 is acknowledged. The references cited on the PTOL 1449 form have been considered.

3. Examiner took notice of remarks and amendments made on 02/02/05. The applicant's traversal on the previous rejection of claims 3-4, 9-14, 16-18, 21, 23-25 was not found persuasive.

Claims 3-4 have been amended to including new limitations: "an interlayer insulating film over the hard mask and wherein the interlayer insulating film is in contact with at least a part of a lateral face of the gate electrode". The previous cited reference (Yoshida et al., U.S. Patent No. 6,528,854) discloses these limitations: the layer 126 made of silicon dioxide formed over the hard mask and this layer is in contact with the sidewalls or the lateral face of the gate electrode (Figs. 1-3D).

Regarding claims 14, 21, applicant's arguments that Fujimoto doesn't disclose the mask is a hard mask and doesn't disclose the sidewalls of the island shaped mask having an angle of inclination of 0 or more, and of 90 or less. Examiner agreed with applicant that Fujimoto doesn't disclose the mask is a hard mask. Examiner didn't cite that the mask suggested in Fujimoto was a hard mask. Fujimoto discloses the mask

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has island shaped which supported the missing limitation in Yoshida. Yoshida discloses the hard mask but fails to disclose the hard mask is an island shape. Fujimoto disclose the mask is island shaped mask. One having skills in the art would modify the shape of the Yoshida's mask as the island shape disclosed in Fujimoto to prevent damage from plasma due to increasing the charge density from decreasing the size/thickness of electrode. Examiner didn't agree with applicant that Fujimoto doesn't disclose the island shaped mask having an angle of inclination of 0 or more, and of 90 or less. As shown in the drawings of Fujimoto, the island shaped mask has an angle less than the angle that is perpendicular to the horizontal surface of the substrate ( $90^\circ$ ) and more than the angle the is the same as the horizontal surface of the substrate ( $0^\circ$ ). It is inherent that the drawings of Fujimoto show that the angle of the mask has an angle of more than  $0^\circ$  and less than  $90^\circ$ .

Claims 9-13, 16-18, 23-25 still stand rejected as in the previous rejection.

Applicant's arguments with respect to claims 15, 19-20, 22, 26-27 are considered but are moot in view of new rejection.

Claims 15, 19-20, 22, 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al., U.S. Patent No. 6,528,854, in view of Yamazaki et al., U.S. Pat. No. 5,459, 090.

### **Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Regarding claims 15 and 22, Yoshida et al. discloses a semiconductor device comprising a gate electrode 116 formed over a gate insulating film 124 and a hard mask 120 formed over the gate electrode. Still regarding to claims 14, 15, 21, and 22, Yoshida et al. discloses a conductive film which is in contact with the gate electrode 108b wherein the conductive film 108b is to serve as a wire for sending a signal to the gate electrode or as a connection layer for connecting a wire with the gate electrode (Fig. 1). However, Yoshida et al. fails to disclose the mask having an arc shape. Yamazaki et al. discloses the similar device and further discloses the device has an arc shaped mask (Figs.2-3D; mask 4 or combination of portions 11 and 13 to make up the arc mask). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a hard mask shaped as an arc-like to prevent damage

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from plasma due to increasing the charge density from decreasing the size/thickness of electrode.

Regarding claims 19, 26, it is conventional and well known in the art that tantalum nitride or tungsten is used as gate electrode material.

Regarding claims 20, 27, Yoshida et al. discloses the hard mask is selected from the group consisting of silicon oxide.

### **Claim Rejections**

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section

351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**Claims 3, 4, 10, 12 are rejected under 35 USC 102 (e) as being anticipated by Yoshida et al., U.S. Patent No. 6,528,854.**

Regarding claims 3, 4, Yoshida et al. discloses a semiconductor device comprising a gate electrode 116 formed over a gate insulating film 124 and a hard mask 120 formed over the gate electrode, the layer 126 made of silicon dioxide formed over the hard mask and this layer is in contact with the sidewalls or the lateral face of the gate electrode (Figs. 1-3D).

Still regarding to claim 4, Yoshida et al. discloses a conductive film which is in contact with the gate electrode 108b wherein the conductive film 108b is to serve as a wire for sending a signal to the gate electrode or as a connection layer for connecting a wire with the gate electrode (Fig. 1).

Regarding claims 10, 12, Yoshida et al. discloses the hard mask is selected from the group consisting of silicon oxide (126/104 made of SiO<sub>2</sub>).

Claims 9, 11, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al., U.S. Patent No. 6,528,854.

Regarding claims 9, 11, and 13, it is conventional and well known in the art that tantalum nitride or tungsten is used as gate electrode material.

Claims 14, 16-18, 21, 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al., U.S. Patent No. 6,528,854, in view of Fujimoto et al., U.S. Pub No. 2002/0102783.

Regarding claims 14, 21, Yoshida et al. discloses a semiconductor device comprising a gate electrode 116 formed over a gate insulating film 124 and a hard mask 120 formed over the gate electrode. Still regarding to claims 14, 21, Yoshida et al. discloses a conductive film which is in contact with the gate electrode 108b wherein the conductive film 108b is to serve as a wire for sending a signal to the gate electrode or as a connection layer for connecting a wire with the gate electrode (Fig. 1). However, Yoshida et al. fails to disclose the mask is shaped as an island shaped. Fujimoto et al. discloses the similar device and further discloses the device has an island shaped mask (Figs. 2B-2D). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a hard mask shaped as an island-like to prevent damage from plasma due to increasing the charge density from decreasing the size/thickness of electrode. Still regarding to claims 14, 21, Fujimoto et al. discloses the



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side walls of the island shaped have an angle of inclination of about 5 to 45 degree which is of 0° or more, or of 90° or less.

Regarding to claims 16, 23, Fujimoto et al. discloses the side walls of the island shaped have an angle of inclination of about 5 to 45 degree which falls into the range recited in claim 16, of 35° or more, or of 50° or less.

Regarding claims 17, 24, it is conventional and well known in the art that tantalum nitride or tungsten is used as gate electrode material.

Regarding claims 18, 25, Yoshida et al. discloses the hard mask is selected from the group consisting of silicon oxide (126/104 made of SiO).

When responding to the office action, Applicants' are advice to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao P. Le whose telephone number is 571-272-1785. The examiner can normally be reached on M-T (7-6).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 571-272-1787. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Thao P. Le', with a stylized, cursive script.

Thao P. Le  
Examiner  
Art Unit 2818  
March 13, 2005.